

REMARKS

Claims 1-34 are pending. Claim 1 has been amended herein. Support for the amendment is detailed below. New claims 29-34 have been added herein.

Support for new claims 29-33 is based on original claims 24-28 and on page 18, lines 15-26 of the specification. Support for new claim 34 is based on page 24, line 13 to page 25, line 12 of the specification.

The Applicants' Response to Rejections under 35 U.S.C. §103

Claims 1-3, 6 and 9 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *Nag et al.* (US 6,313,010 B1) in view of *Chu* (US 6,180,493 B1). In response thereto applicants have amended independent claim 1 to more distinctly claim the subject matter regarded as the invention.

As is seen in Figures 1a to 1d, *Nag et al.* discloses the steps of forming a silicon oxide layer 104 and silicon nitride layer 106 on a substrate (Fig. 1a); the step of etching to form a trench 110 (Fig. 1b); the step of oxygenating to form a silicon oxide in the trench 114 (Fig. 1c) and filling the trench with an insulation 120 (Fig. 1d).

The Office Action notes that a second silicon nitride layer is not formed in the trench. For the silicon nitride layer, the Office Action relies on *Chu*. *Chu* discloses the formation of a silicon nitride buffer layer 214 within a trench 208, followed by insulation 216.

The Office Action states that the formation of a second silicon oxide layer 212 disclosed in *Chu* is immaterial because claim 1 utilizes "comprising." Hence, the claim is open to additional steps.

The second liner layer 212 of *Chu* is “conformal to the device profile” and “formed over the substrate” (col. 4, lines 32-34). The second liner layer is formed by CVD utilizing TEOS (col. 4, lines 40-45). This layer is necessary to the invention of *Chu* since it is required as an etching stop layer. Column 5, lines 4-6 reads:

As shown in Fig. 2B, (sic)(should read “2E”) using the second liner layer 212 as an etching stop layer, the exposed buffer layer 224 is removed.

Applicants respectfully submit that if the combination of *Nag et al.* and *Chu* would have been obvious, the end embodiment must include the second liner layer 212 as it is required by *Chu*. Thus, applicants have added an amendment to claim 1 which limits the silicon nitride layer formation step to being performed on the first silicon oxide layer.

Specifically, step (2) has been amended to read:

(d) forming a second liner insulating layer of silicon nitride in direct contact with said first liner insulating layer, . . .

This amendment eliminates the possibility of including a second silicon oxide layer by TEOS CVD between the original silicon oxide layer and the silicon nitride layer. Thereby, *Chu* is not disclosing like steps as it requires the TEOS CVD silicon oxide layer in its formation. Thus, applicants respectfully submit that the §103 rejection is traversed by this amendment.

Claims 24 and 27 under 35 U.S.C. §103(a) as being unpatentable over *Dunn et al.* (US 6,258,695 B1), and claim 26 under 35 U.S.C. §103(a) as being unpatentable over *Dunn et al.* as applied to claim 24, and further in view of *Nag et al.* in view of *Chu*.

Applicants respectfully submit that the rejection based on *Dunn et al.* does not meet the criteria for a *prima facie* obviousness rejection.

First, there is no teaching, suggestion or motivation to lead one skilled in the art to combine liner layers of silicon oxide and silicon nitride. The Office Action points to col. 2, lines 5-10 of *Dunn et al.* However, this disclosure is merely a listing of types of trench liners. There is no suggestion of any advantage or utility to combining the liners. In fact, the disclosure of the *Dunn et al.* invention teaches away from multiple liners.

Dunn et al. teaches adding carbon to the trench after formation of a silicon oxide layer so as “to penetrate the thin oxide layer 110 at the trench bottoms 114 and enter the silicon there under. . .” (col. 2, lines 47-49). Hence, one skilled in the art would not utilize a multiple liner because the carbon would not be able to penetrate to a sufficient depth to reach the silicon substrate.

Additionally, there is no teaching of utilizing silicon nitride containing carbon. The Office Action claims that residual carbon would be present in any added silicon nitride layer. However, this does not rise to the level of obviousness as there is no teaching or suggestion that adding carbon has a benefit or utility. Likewise, any residual carbon will not have the desired effect of improving adhesion with a silicon oxide layer, as taught at page 25, lines 10-12 of the specification.

Wherefore, applicants respectfully traverse the rejections relying on *Dunn et al.* and request withdrawal of the rejections.

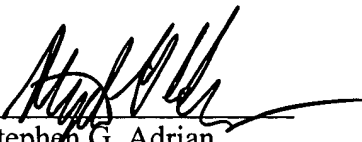
For at least the foregoing reasons, it is believed that this application is now in condition for allowance. If, for any reason, it is believed that this application is not in condition for allowance, Examiner is encouraged to contact the Applicants’ undersigned attorney at the telephone number below to expedite the disposition of this case.

U.S. Patent Application Serial No.: 10/721,870
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Reply to Office Action of July 27, 2004

In the event that this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 50-2866.

Respectfully submitted,

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Attachments: Amendment Transmittal w/fee
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